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UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 CFR 1.53(b))	Attorney Docket No.	10845-131
	First Inventor	Steven T. Kelling
	Title	METHOD AND APPARATUS FOR COLLECTING...
	Express Mail Label No.	EL449645784US

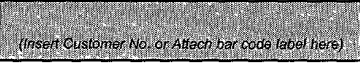
APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20231
1. <input checked="" type="checkbox"/> Fee Transmittal Form (e.g., PTO/SB/17) <i>(Submit an original and a duplicate for fee processing)</i>	7. <input type="checkbox"/> CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
2. <input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.	8. Nucleotide and/or Amino Acid Sequence Submission <i>(if applicable, all necessary)</i>
3. <input checked="" type="checkbox"/> Specification [Total Pages <u>29</u>] <i>(preferred arrangement set forth below)</i> <ul style="list-style-type: none">- Descriptive title of the invention- Cross Reference to Related Applications- Statement Regarding Fed sponsored R & D- Reference to sequence listing, a table, or a computer program listing appendix- Background of the Invention- Brief Summary of the Invention- Brief Description of the Drawings <i>(if filed)</i>- Detailed Description- Claim(s)- Abstract of the Disclosure	a. <input type="checkbox"/> Computer Readable Form (CRF) b. Specification Sequence Listing on: <ul style="list-style-type: none">i. <input type="checkbox"/> CD-ROM or CD-R (2 copies); orii. <input type="checkbox"/> paper c. <input type="checkbox"/> Statements verifying identity of above copies
4. <input checked="" type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets <u>9</u>]	ACCOMPANYING APPLICATION PARTS
5. Oath or Declaration <u>Unexecuted</u> [Total Pages <u> </u>] <ul style="list-style-type: none">a. <input checked="" type="checkbox"/> Newly executed (original or copy)b. <input type="checkbox"/> Copy from a prior application (37 CFR 1.63 (d)) <i>(for continuation/divisional with Box 17 completed)</i><ul style="list-style-type: none">i. <input type="checkbox"/> DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).	9. <input type="checkbox"/> Assignment Papers (cover sheet & document(s))
6. <input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76	10. <input type="checkbox"/> 37 CFR 3.73(b) Statement <input type="checkbox"/> Power of Attorney <i>(when there is an assignee)</i>
	11. <input type="checkbox"/> English Translation Document <i>(if applicable)</i>
	12. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations
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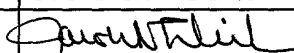
17. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Prior application information: Examiner _____ Group / Art Unit: _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

18. CORRESPONDENCE ADDRESS					
<input type="checkbox"/> Customer Number or Bar Code Label  or <input checked="" type="checkbox"/> Correspondence address below <i>(Insert Customer No. or Attach bar code label here)</i>					
Name	Jerry Cohen				
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Signature			Date <u>Oct 31, 2000</u>

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FEE TRANSMITTAL for FY 2001

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT (\$ 511.00

Complete if Known

Application Number
Filing Date Herewith
First Named Inventor Steven T. Kelling
Examiner Name
Group Art Unit
Attorney Docket No. 10845-131

METHOD OF PAYMENT

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number 03-2410 Order No.: 10845-131
Deposit Account Name Perkins, Smith & Cohen

- ☒ Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17
☒ Applicant claims small entity status. See 37 CFR 1.27

2. ☒ Payment Enclosed:

☒ Check ☐ Credit card ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
101 710	201 355	Utility filing fee	355
106 320	206 160	Design filing fee	
107 490	207 245	Plant filing fee	
108 710	208 355	Reissue filing fee	
114 150	214 75	Provisional filing fee	

SUBTOTAL (1) (\$ 355.00

2. EXTRA CLAIM FEES

Total Claims 24 -20** = 4 X Fee from below 9 = 36
Independent Claims 6 - 3** = 3 X 40 = 120
Multiple Dependent =

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
103 18	203 9	Claims in excess of 20
102 80	202 40	Independent claims in excess of 3
104 270	204 135	Multiple dependent claim, if not paid
109 80	209 40	** Reissue independent claims over original patent
110 18	210 9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ 156.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	
127 50	227 25	Surcharge - late provisional filing fee or cover sheet	
139 130	139 130	Non-English specification	
147 2,520	147 2,520	For filing a request for ex parte reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	
115 110	215 55	Extension for reply within first month	
116 390	216 195	Extension for reply within second month	
117 890	217 445	Extension for reply within third month	
118 1,390	218 695	Extension for reply within fourth month	
128 1,890	228 945	Extension for reply within fifth month	
119 310	219 155	Notice of Appeal	
120 310	220 155	Filing a brief in support of an appeal	
121 270	221 135	Request for oral hearing	
138 1,510	138 1,510	Petition to institute a public use proceeding	
140 110	240 55	Petition to revive - unavoidable	
141 1,240	241 620	Petition to revive - unintentional	
142 1,240	242 620	Utility issue fee (or reissue)	
143 440	243 220	Design issue fee	
144 600	244 300	Plant issue fee	
122 130	122 130	Petitions to the Commissioner	
123 50	123 50	Petitions related to provisional applications	
126 240	126 240	Submission of Information Disclosure Stmt	
581 40	581 40	Recording each patent assignment per property (times number of properties)	
146 710	246 355	Filing a submission after final rejection (37 CFR § 1.129(a))	
149 710	249 355	For each additional invention to be examined (37 CFR § 1.129(b))	
179 710	279 355	Request for Continued Examination (RCE)	
169 900	169 900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$

SUBMITTED BY

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Signature

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(Attorney/Agent)

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Date OCT 31, 2000

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"Express Mail" mailing label number: EL449645784US

Date of Deposit: Oct. 31, 2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR LETTERS PATENT
(UTILITY PATENT)

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INVENTION TITLE: METHOD AND APPARATUS FOR COLLECTING AND
EXPRESSING GEOGRAPHICALLY-REFERENCED DATA

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TO: Honorable Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

Your applicant(s), named above hereby petition(s) for
grant of a utility patent to him(them) or any assignee(s) of
record, at the time of issuance, for an invention more
particularly described in the following specification and
claims, with the accompanying drawings, verified by the
accompanying Declaration and entitled:

007E01" 20420260

**METHOD AND APPARATUS FOR COLLECTING AND EXPRESSING
GEOGRAPHICALLY-REFERENCED DATA**

FIELD OF THE INVENTION

This invention relates generally to data collection and retrieval, and more particularly to collection and retrieval of geographically-referenced data and to data collection from a plurality of observers over the Internet.

BACKGROUND OF THE INVENTION

When studying phenomena having specific occurrences over a widespread geographic area, it is desirable to be able to receive data from a plurality of observers. Where the specific occurrences are mobile, such as birds, or likely to move rapidly, such as a highly infectious disease, collection of data in real-time from the plurality of observers is essential to a full and accurate study. In order to participate easily, the observers need an easy way to report their findings and to link the data to the geographic location to which it relates. Linking the data in some way in addition to the geographic reference is desirable. Non-contiguous points should be linkable in order to effectively analyze the data.

It remains desirable to facilitate multiple observer projects conducted over a large geographic area.

It is an object of the present invention to provide a method and apparatus to enable a plurality of observers to input geographically-referenced data in real time.

It is another object of the present invention to provide
5 a method and apparatus to enable analysis of non-contiguous geographically-referenced data.

It is another object of the present invention to provide a method and apparatus to enable ornithological studies.

10 SUMMARY OF THE INVENTION

The problems of collecting and expressing geographically-referenced data are solved by the present invention of a web-based method and apparatus for collecting and expressing geographically-referenced data.

15 Internet observers may pinpoint locations on a scalable map in order to fix data by latitude and longitude. It also permits the selection of non-contiguous groups of geographic data points for analysis. The system may be used to track bird sightings and migration patterns. The mapping is
20 scalable and can be integrated with a Geographic Information System (GIS), e.g. elevation, vegetation or city maps. Variations over time can be analyzed for a specific point, and pattern movements between points can be tracked.

The present invention together with the above and other
25 advantages may best be understood from the following detailed description of the embodiments of the invention illustrated in the drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of a system for collecting and expression of geographic-referenced data according to principles of the invention;

5 Figure 2 is flow chart of the process of creation of an observation site according to principles of the invention;

Figure 3 is a flow chart of the process of submitting a query according to principles of the present invention;

10 Figure 4 is a table of fields of the locations table of the spatially-linked database of Figure 1;

Figure 5 is a table of fields of the observations table of the spatially-linked database of Figure 1;

Figure 6 is a first view of the interactive map of the present invention;

15 Figure 7 is a second view of the interactive map of the present invention showing a small extent of the view of Figure 6;

20 Figure 8 is a part block diagram, part flow chart of the creation of an observation point according to the present invention; and

Figure 9 is a part block diagram, part flow chart of a query according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

25 Figure 1 shows a web-based system for collecting and expressing geographic-referenced data according to principles of the invention. A web server 5 is connected to the

Internet 10. A map server/data processor ("map server") 15
and a spatially-linked database 20 are connected to the web
server 5. The configuration is merely exemplary. For
example, in alternative embodiments, the map server and
5 database may be combined, the map server and the database may
be connected together by a non-Internet network, or the data
processor portion may be separated from the map server.
Other configurations are possible within the scope of the
invention.

10 The database 20 stores data records having the general
form of a location and data associated with that location.
In the present embodiment of the invention, the data is
stored as two tables, a locations table 25 and an
observations table 30. The tables will be described in
15 detail below. In an illustrative embodiment of this
invention, the database comprises a plurality of locations
for storing data from corresponding of a set of points
disposed within a geographic area. The geographic area may
illustratively be small, e.g., Central Park within New York
20 City, or as large as the entire earth, depending upon the
needs of the user to collect data.. Until established as a
data collection site as explained below, the locations of the
points are initially undetermined. Each of the storage
locations is dedicated to storing data related to a
25 corresponding point within the geographic area. More
particularly, the data may illustratively reflect an event
occurring at its point. In an illustrative embodiment of

1 this invention, the event may be a bird siting. As will be
elaborated below, there are many other events that may be
observed and applications for this invention. In one
illustrative embodiment of this invention, data base is
5 characterized as being geographically structured, e.g., each
storage location is addressed according to the geographic
coordinates of the point to which the data stored therein is
related. Other database configurations are possible within
the scope of the present invention. For example, it is
10 possible to store the locations and observations in the same
table.

A plurality of observers 35 are connected to the map
server and database over the Internet. A plurality of non-
observing users 40 are also able to access the system over
15 the Internet. Often, an observer and a non-observing user
will be the same entity. The observers and non-observing
users are clients of the map server. The map server serves
an interactive map which the observers use to enter data into
the system and the users use to query the system.

20 The current embodiment of the present invention includes
software applications from the Environmental Systems Research
Institute, Inc. located in Redlands, California. The
MapObjects Internet Map Server connects an application
program written in Visual Basic to a web server. It enables
25 two-way, stateless communication between the application
program and the web browser. Stateless here means that there
is no session management and that each communication is a

unique event. MapObjects is an Active X control object (also a COM object). MapObjects is a plug-in module for Visual Basic and other languages that renders maps from data files of map features.

5 An example of a use for the present system is ornithology studies, specifically the study of bird migration. The study of bird migration takes place over a large geographic area with data collected from a plurality of observers. The mobility of the subject birds in a study
10 requires real-time entry of observed data. Potentially, observers over the entire range of the study area may enter data using the system of the present invention.

Creating an observation site.

15 Figure 2 is a flow chart of the process of creating an observation site on the interactive map, the site to be stored in the database.

20 First, the client program is downloaded over the Internet, block 100. In the present embodiment of the invention, the user's browser loads a Java applet. In alternative embodiments of the invention, the client program may use other languages. The user is presented with a map of the project area, along with tools to navigate the map (pan, zoom, etc.).

25 Next, as the user navigates to smaller map extent, already-existing observation sites become visible, block 105. At even smaller map extent, point creation tools become available. The map scale at which the point creation tools

becomes visible is a configurable property. In the present embodiment of the invention, the point-making tools become visible when a tenth of a degree of latitude or less is visible on the map.

5 Then, the user, or data gatherer, indicates that an observation site is to be created, in the present embodiment, by clicking with a mouse on a point on the map. The map accepts a map point entered by the user, block 110. The client program draws a point for feedback, and the user can
10 make further clicks on the map to adjust the point. Other types of data entry are possible within the scope of the present invention.

 The user is then prompted to provide a name for the point, block 110.

15 After the user completes the location, the user submits the location to the system. The client program packages the location as a set of map coordinates, makes calls to the server to do map coordinate conversions, if necessary, to
20 convert the geographic point of the location to latitude and longitude, block 115. The client program packages other parameters associated with the location, such as the user's login name, the project name, and other data associated with an event occurring at the geographic point, e.g. a bird sighting, into a URL, block 120. The URL is sent to the
25 server, block 125.

 The server parses the incoming parameters, and converts the latitude and longitude coordinate pair into an object in

software that represents the location, block 130. In an illustrative embodiment of this invention, the set of maps displayed to the user or data gatherer includes at least one map, which is geographically referenced map. The

5 geographically referenced map is adapted, as will be explained below, to receive a map point or mark that is placed thereon in relative position with respect to at least one reference point whose coordinates are known. As

indicated above, the geographic coordinates of the point and therefore the geographic location of the map point are initially undetermined. As is well known in the art, the relative position of the map point is compared with that of the map's reference point, whereby the coordinates of the map point may be calculated, i.e., ratios of the relative

15 distances along the axes of latitude and longitude of the map point and the reference point are calculated; the product of these ratios and the known coordinates of the reference point are an accurate indication of the coordinates of the map point or mark made by the data gatherer.

20 The server then adds the object, including its location attributes, to the database via the map component, which submits the location to the spatially-indexed database, block 135.

The server creates a map overlay showing the newly-
25 entered location and sends an updated map view back to the client, block 140.

The user can repeat the previous steps to create another location, or may submit observation data associated with the newly-entered location.

The present embodiment of the invention is implemented as follows. If a user is logged in as a legitimate user for a project, the user can download the client program. The user navigates through different maps, customized for the project, until the user is close to a desired destination. If the user is zoomed in close enough, the user can click a Place Point button. This button enables the client program to capture a mouse click on the map. When the user clicks, the client program draws a dot on the map, and also shows the latitude and longitude, for feedback. The client program may have to request the server to convert the point to latitude and longitude, as some maps are in different units. The client program accepts a name in a field for the location (with some restrictions), and the user can click a button to submit the location, or, click on the map again to move it. If submitted, a URL is packaged with parameters as before. The server gets this URL and creates an object in software that represents a location, using the parameters submitted. It then adds this object to a map layer using the MapObjects software application. The server also sets other database fields associated with the location, such as, project, user, or date. Meanwhile, the client program requests a new map from the server so that the user can see the location displayed. In the present embodiment of the invention, this

location is a permanent record in the spatially-indexed database of observation locations.

Submitting a spatial query.

Figure 3 is a flow chart of the process of submitting a spatial query and receiving an output of data from the database.

First, the client program is downloaded over the Internet, block 200. In the present embodiment of the invention, the user's browser loads a Java applet. The user is presented with the map of the project area, along with tools to navigate the map (pan, zoom, etc.).

As the user navigates to smaller map scales, observation sites become visible, block 205. In the present implementation, sites designated as Christmas Bird Count (CBC) circles become visible. The Christmas Bird Count is an ongoing wildlife survey sponsored by the National Audubon Society. The survey is designed as a series of circular count areas, and observers count birds within these "circles" each year on a prespecified day around 25 December. The CBC was started in 1900 and has over 1,500 circles.

The system then accepts a choice from the user of how to select observation sites, block 210. In the present embodiment of the invention, there are four options: a single site, two or more sites one at a time, or selection by enclosing sites in an arbitrary shape or by selecting a pre-defined geographic area such as a state or a province.

The user then makes a selection, and the selection is indicated as a map overlay, block 215. The map overlay provides feedback as to which observation sites are being selected, and therefore will be included in the database query.

The client program also presents other choices for composing the database query, block 220. In the present embodiment of the invention these choices are which bird species to include, and what time period to cover.

The finished query is then submitted to the server, block 225. This is accomplished by the client which assembles the query parameters into a URL, and opens a connection to the server, transmitting the parameters. If the user selected the arbitrary shape for the query, the user's polygon is sent to the server as a series of map coordinate pairs.

The server parses the incoming parameters, and converts the coordinate pairs into an object in software that represents a polygon, block 230.

The server performs a spatial search, retrieving the observation sites contained within the polygon, and takes the list of observation sites found and performs a database query using the list and other parameters, block 235.

The results of the server query to the database are used to create histograms and tables of results, block 240. The histograms and tables are incorporated into an HTML page and sent to the user, block 245. The server then disposes of

the results, the polygon, and parameters, and is ready for another query. The user may perform another query using the same polygon, which the client program has saved.

The present embodiment of the invention is implemented as follows. The user accesses the web site, and the client program is downloaded to the user's computer. In the client program, the user can navigate to new maps using navigation tools such as pan and zoom. The position of Christmas Bird Count circles are plotted on the maps. The user goes to a tab in the client program interface, and indicates the method to select circles (single, one by one, or by shape). If the user chooses "by shape", the user can then click on the map repeatedly. Each click becomes a vertex of a polygon. The user does not need to "close" the polygon; the client program will do it. The polygon is drawn over the map while the user creates it. When finished, the user goes to another tab in the interface and indicates which species is of interest for the query. There is a database lookup functionality to help users find a species using only part of a name. After choosing the species, the user chooses a beginning and ending year. The client program limits the number of years.

At this point, the user submits the query by clicking a button. The query parameters are packaged by the client program as standard Universal Resource Locator (URL) Web protocol parameters (i.e., http:

//website/.esrimap?parameter1="something"¶meter2="something+else"), and sent to the server.

When the server sees the URL, it passes the URL to the MapObjects application which in turn passes it to a Visual

5 Basic server component. The server parses the request parameters. It takes the points that were part of the polygon and creates a software object that represents a polygon. It then performs a spatial query on the polygon asking the server which CBC circles are contained in the polygon. In

10 the present implementation of the invention, the server uses ArcSDE from the ESRI Corporation to accomplish this. The server then uses this list, along with the species, and the years specified, to create an Structured Query Language (SQL) statement. The server uses that statement to do a standard

15 relational database query. The results of the query are used to generate histograms and a table of results. An HTML page is created by the server and sent back to the client program in the user's browser. The client program tells the user's browser to display this new HTML page, and the user sees the

20 histograms. The server disposes of the polygon and the query results. The client program, however, retains the points that the user specified, and the user can do a new query based on the same polygon, just changing the species or years. The points will persist until the user asks for a new map (by

25 panning, say), or creates a new query shape or selection, or if the user quits out of the program.

Figure 4 shows a selection of fields from the table of locations from the spatially-linked database of Figure 1. The table has a plurality of fields. In the present embodiment, the fields are as follows:

- 5 **LOC_ID** 300 [Location ID] - a unique identifier for a location, assigned internally, never displayed;
- NAME** 302 - location name;
- DESCRIPTION** 304 - free text location description;
- ENTRY_TECHNIQUE** 306 - method used to enter and create the
- 10 location record;
- UNCERTAINTY_RADIUS** 308 -
- CREATION_DT** 310 [Creation Date/Time] - date/Time the observation record was created;
- LAST_EDITED_DT** 312 [Last Edited Date/Time] - date/Time the
- 15 observation record was last edited;
- OWNER_ID** 314 - user ID of the observer or non-observing user who 'owns' the location record;
- LATITUDE** 316 - latitude of the location in decimal degrees;
- LONGITUDE** 318 - longitude of the location in decimal degrees;
- 20 **STATPROV_LIST** 320 - list of States/Provinces this location intersects;
- COUNTRY_CODE** 322 - ISO standard country code for the location;
- FEATURE** 324 - Link to another table which contains the map-
- 25 drawing characteristics of the location; and
- IN_USE** 326 - (Yes/No) Can this location be used for new observations.

Figure 5 shows the table of bird observations from the spatially-linked database of Figure 1. The table has a plurality of fields. In the present embodiment, the fields are as follows:

- 5 **PROJ_ID** 350 [Project Identifier] - project under which the observation was made;
- OBS_DT** 352 [Observation Date/Time] - date and time of the observation;
- SPECIES_CODE** 354 - a code for the bird species observed;
- 10 **HOW_MANY** 356 - number of birds of this species observed;
- VALID** 358 - Valid/Invalid flag: allows reviewers or bad-data filtering programs to suppress a record from reports or analyses without deleting it;
- PROTOCOL_ID** 360 - A code for the project's data collection
- 15 protocol;
- LOC_ID** 362 [Location ID] - a link to the Location Table - Location where this observation was made;
- USER_ID** 364 - ID of the person who made the observation;
- DURATION_HRS** 366 - Number of hours the observer spent
- 20 looking for birds; used to standardize 'HOW_MANY' based on amount of observer effort expended;
- COMMENTS** 368 - Observer's free text comments on the observation;
- CREATION_DT** 370 [Creation DateTime]- Date/Time the
- 25 observation record was created;
- LAST_EDITED_DT** 372 [Last Edited DateTime] - Date/Time the observation record was last edited; and

REVIEWED 374 [Expert Reviewed] - Yes/No Indicating whether this record been expert reviewed.

The configurations of the tables in Figures 4 and 5 are merely exemplary. In alternative embodiments of the invention, there may be additional tables. The system has predefined required fields for data entry, however, any number of additional data fields associated with each observation or location can be defined and stored for each project.

Figure 6 is a first view of the interactive map 400 according to principles of the invention. The user is provided with a plurality of functions 402 to move around the map, e.g. to pan and to zoom in or out. The map coordinate points 404 are provided. The user may specify an area to examine more closely by drawing a polygon 406 around the desired destination.

Figure 7 is a second view of the interactive map according to principles of the invention. Figure 7 is a zoomed in view of the area marked in Figure 6. In the present embodiment at this scale, observation points 420, 422 become visible.

Figure 8 is a part block diagram, part flow chart of the creation of an observation point, or location. The user specifies a point 450 in the interactive map at the client 452. The client provides the data over the Internet 10 to the server 15 which stores the point in the spatially-linked database 20. The point can be seen as part of a map layer

454, overlaid on a map 456 of the geographic features of the area.

Figure 9 is a part block diagram, part flow chart of the query process. The user, at the client level 452, provides a polygon 460 or some other selection of points to be included in the query. The user can provide additional information in the query such as, type of bird and time period during which observations were taken. The client program sends the data over the Internet 10 to the server 15 which generates a map layer 462 to return to the user as well as query results in other visual formats such as a histogram 464.

The implementation described herein was applied to ornithology, however other applications, as would be contemplated by one skilled in the art, are within the scope of this invention. It may be applied to any wildlife for reporting and inventory purposes, or for reporting specific problems, e.g. disease, symptoms, or danger to humans. Wildlife includes mammals, aquatic life, amphibians, reptiles, and butterflies, etc. Wildlife can also include plant life, e.g., taking inventory on a tree species, or an offshore algal bloom. The present invention may also be used for disease tracking in humans or studying commercial product use. The present invention may also be used to study weather conditions, illegal dump sites, crime or suspicious activity. The present invention may also be used to study electromagnetic fields, e.g., users reporting on signal strength of their cell phones in different locations to a

company. The present invention may also be used for amateur archeology, for example, for reporting where fossils or artifacts are found. Other applications within the spirit of this invention include without limitation environment impact studies, e.g., the construction industry; any monitoring project requiring localized information analyzed towards regional applications; self reported household usage of products and service by geographic area; auditing the performance of transportation systems, e.g., a transportation system; analysis of energy usage geographically; marketing information analysis, e.g., distributed mapping of marketing "hits"; commercial application of existing data as an indicator of changes in environmental systems; data gathering for a particular industry and providing analysis for that industry; track the spread of a disease; monitor the growth or condition of plants in a geographic area; monitor the location of vehicles, e.g., vans, taxis, service vehicles etc.; the use by consumers of pesticides and fertilizers; the geographic incidence of traffic and other accidents; and other events/applications as would be appreciated by one skilled in the art.

Additional implementations of the invention include the entry of data into computers that are off-line for later uploading to the map server over the web.

It is to be understood that the above-described embodiments are simply illustrative of the principles of the invention. Various and other modifications and changes may

be made by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

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What is claimed is:

1 1. A computer-implemented method for aggregating and
2 expressing geographically-linked data provided by a plurality
3 of observers, comprising the steps of:

4 a) providing an interactive map capable of receiving
5 location and associated data over the Internet from said
6 plurality of observers;

7 b) receiving a first location and first associated data
8 from a first observer;

9 c) storing said location and said first associated data
10 in a database as data records;

11 d) receiving a second location and second associated
12 data from a second observer;

13 e) repeating steps c) and d) with said second location
14 and second associated data;

15 f) receiving a spatial query from a user specifying at
16 least one location on said interactive map; and

17 g) providing the data records associated with the user-
18 specified at least one location;

19 whereby data records received from the plurality of
20 observers may be stored according to geographical location
21 and retrieved for study according to a geographical-based
22 query.

1 2. The method of claim 1 further comprising the step of
2 translating said first location to one or more map coordinate
3 points; and wherein said step of storing said first location

4 further comprises storing said map coordinate points in said
5 database.

1 3. The method of claim 1 further comprising the step of
2 translating said first location to a line; and wherein said
3 step of storing said first location further comprises storing
4 said line in said database.

1 4. The method of claim 1 further comprising the step of
2 translating said first location to a polygon; and wherein
3 said step of storing said first location further comprises
4 storing said polygon in said database.

1 5. The method of claim 1 wherein said second location
2 overlaps said first location.

1 6. The method of claim 1 further comprising the steps of:
2 i) receiving a user-specified link factor;
3 j) selecting data records from said database using said
4 first link factor;
5 k) creating a map overlay by linking said selected
6 records; and
7 l) overlaying said map overlay on said interactive map.

1 7. The method of claim 1 further comprising the steps of
2 providing a plurality of references to each of said locations

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3 in said interactive map, any one of said plurality of
4 references to be used as a location point specifier.

1 8. The method of claim 7 wherein the step of providing a
2 plurality of references further comprises displaying a list
3 of available references for a user-specified location on the
4 interactive map.

1 9. The method of claim 1 wherein said interactive map has a
2 plurality of layers and said at least one location is
3 specified according to layer.

1 10. The method of claim 7 wherein said plurality of
2 references includes longitude and latitude.

1 11. The method of claim 7 wherein said plurality of
2 references includes a place name.

1 12. The method of claim 7 wherein said plurality of
2 references includes an observer-specified name.

1 13. The method of claim 7 wherein said plurality of
2 references includes geographical association reference.

1 14. The method of claim 6 wherein said link factor is a
2 selected entry type in said data records.

1 15. The method of claim 6 wherein said link factor is a
2 project name included in said data records.

1 16. The method of claim 6 further comprising the steps of:
2 m) receiving at least one additional user-specified link
3 factor;
4 n) selecting additional data records from said database
5 using said at least one additional link factor;
6 o) creating a second map overlay by linking said
7 additional data records; and
8 p) overlaying said second map overlay on said
9 interactive map.

1 17. A computer-implemented method for accumulating
2 geographically-linked data in order to respond to
3 geographical based queries, comprising the steps of:
4 a) providing an interactive map;
5 b) receiving a plurality of locations and a plurality of
6 associated data;
7 c) translating said plurality of locations to one or
8 more map coordinate points;
9 d) storing said one or more map coordinate points and
10 said plurality of associated data in a database as data
11 records;
12 g) receiving at least one geographical based query from
13 at least one user, said at least one user specifying at least
14 one location point on said interactive map; and

15 h) providing the data records associated with the user-
16 specified at least one location.

1 18. A computer-implemented method for conducting ornithology
2 studies, comprising the steps of:

3 a) providing a web-based interactive map capable of
4 receiving as input locations and associated data from a
5 plurality of servers;

6 b) creating a plurality of bird observation sites in
7 response to input from said plurality of observers;

8 c) accepting locations and associated data from said
9 plurality of observers;

10 d) translating said locations to map coordinate points;

11 e) relating said associated data to bird observation
12 sites using said map coordinate points; and,

13 f) storing said associated data in a database at
14 respective related bird observation sites.

1 19. The method of claim 18 further comprising the steps of:

2 g) accepting a spatial query from a user, said spatial
3 query including at least one bird observation site;

4 h) accessing said database for data records associated
5 with said at least one bird observation site; and

6 i) creating a report from data records found in step h).

1 20. The method of claim 19 wherein said spatial query
2 further comprises a bird species.

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1 21. A computer-implemented method for collecting data from
2 at least one of a plurality of points of interest, the
3 location of the one point being initially undetermined, the
4 collected data being indicative of an event occurring at the
5 one point of interest, said method comprising the steps of:

6 a) providing at least one geographically referenced map
7 for receiving a mark indicative of the relative position of
8 the one point of interest, the one map including at least one
9 reference points whose geographic coordinates are known;

10 b) processing the relative position of the one point of
11 interest with respect to the one reference point to provide
12 geographic coordinates of the one point of interest; and

13 c) associating the geographic coordinates with the data
14 related to the one point of interest.

1 22. A computer-implemented method for facilitating the
2 collection and inputting of data to a centrally disposed
3 database by a plurality of data gatherers by use of a network
4 which is accessible from points within a geographic area, the
5 data being indicative of an event occurring at one of a
6 plurality of points of interest within the geographic area,
7 the location of the plurality of points of interest being
8 initially undetermined, said method comprising the steps of:

9 a) downloading over the network upon request of at least
10 one of the plurality of data gatherers at least one
11 geographically referenced map to the one data gatherer, the

12 one geographically referenced map including at least one
13 reference point whose geographic coordinates are known and is
14 adapted to receive a mark inputted by the data gatherer and
15 indicative of the relative position of the one point of
16 interest;

17 b) receiving at the centrally disposed data base the
18 mark and the data related to the mark; and

19 c) processing the relative position of the one point of
20 interest with respect to the one reference point to provide
21 the geographic coordinates of the one point of interest.

1 23. The computer-implemented method of claim 22, wherein the
2 database includes a plurality of storage locations that are
3 respectively addressable by the coordinates of corresponding
4 points of interest, and there is a further included the step
5 of inputting the data related to the one point of interest to
6 the storage location addressed by the coordinates of the data
7 related to the corresponding point of interest.

1 24. The method of constructing and inputting data into a
2 database, which is connected to a network and is accessible
3 from a plurality of points within a geographic area, the
4 location of the plurality of points of interest being
5 initially undetermined, the data being indicative of an event
6 occurring at one of a plurality of points of interest within
7 the geographic area, said method comprising the steps of:

- 8 a) constructing the database to have a plurality of
- 9 storage locations, each of said storage locations being
- 10 dedicated to receive data from a corresponding one point of
- 11 interest and addressable in accordance with the geographic
- 12 coordinates of the corresponding one point of interest;
- 13 b) providing at least one geographically referenced map
- 14 for receiving a mark indicative of the relative position of
- 15 the one point of interest, the one map including at least one
- 16 reference point whose geographic coordinates are known;
- 17 c) processing the relative position of the one point of
- 18 interest with respect to the one reference point to provide
- 19 geographic coordinates of the one point of interest;
- 20 d) addressing one of the storage locations according to
- 21 the geographic coordinates of the one point of interest; and
- 22 e) inputting data relative to the one point of interest
- 23 into the addressed storage location.

ABSTRACT OF THE DISCLOSURE

A web-based implemented system in which observers may pinpoint locations on a scalable map in order to fix data by latitude and longitude and to collect data describing that location. Also permitted within the system is the selection of non-contiguous groups of geographic data points for analysis. Although not limited thereto, the system may be used to track bird sightings and migration patterns as well as other bird related information and data. The mapping is scalable and can be integrated with a Geographic Information System (GIS), e.g. elevation, vegetation or city maps. Variations over time can be analyzed for a specific point, and pattern movements across points can be tracked.

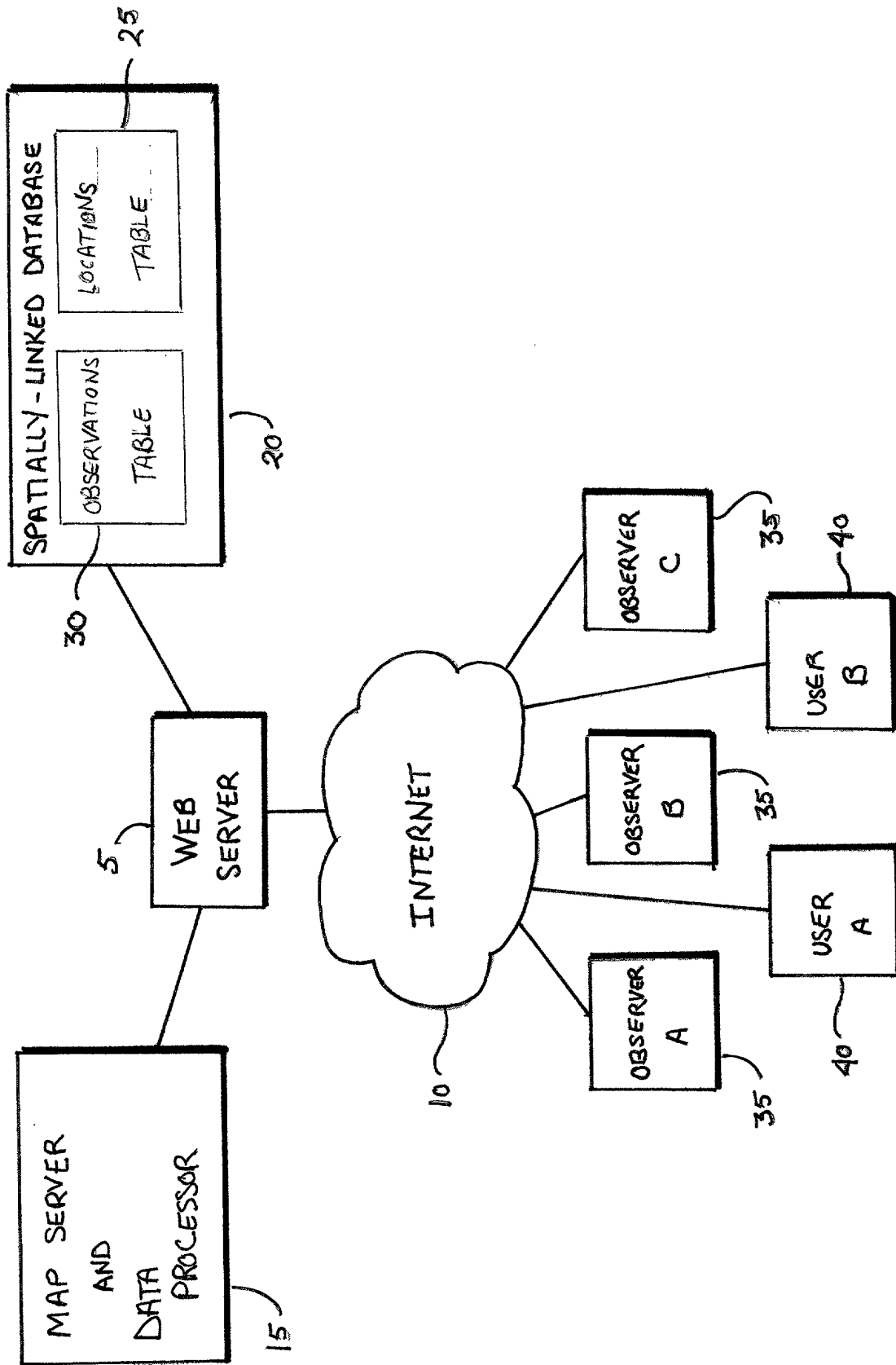


FIG. 1

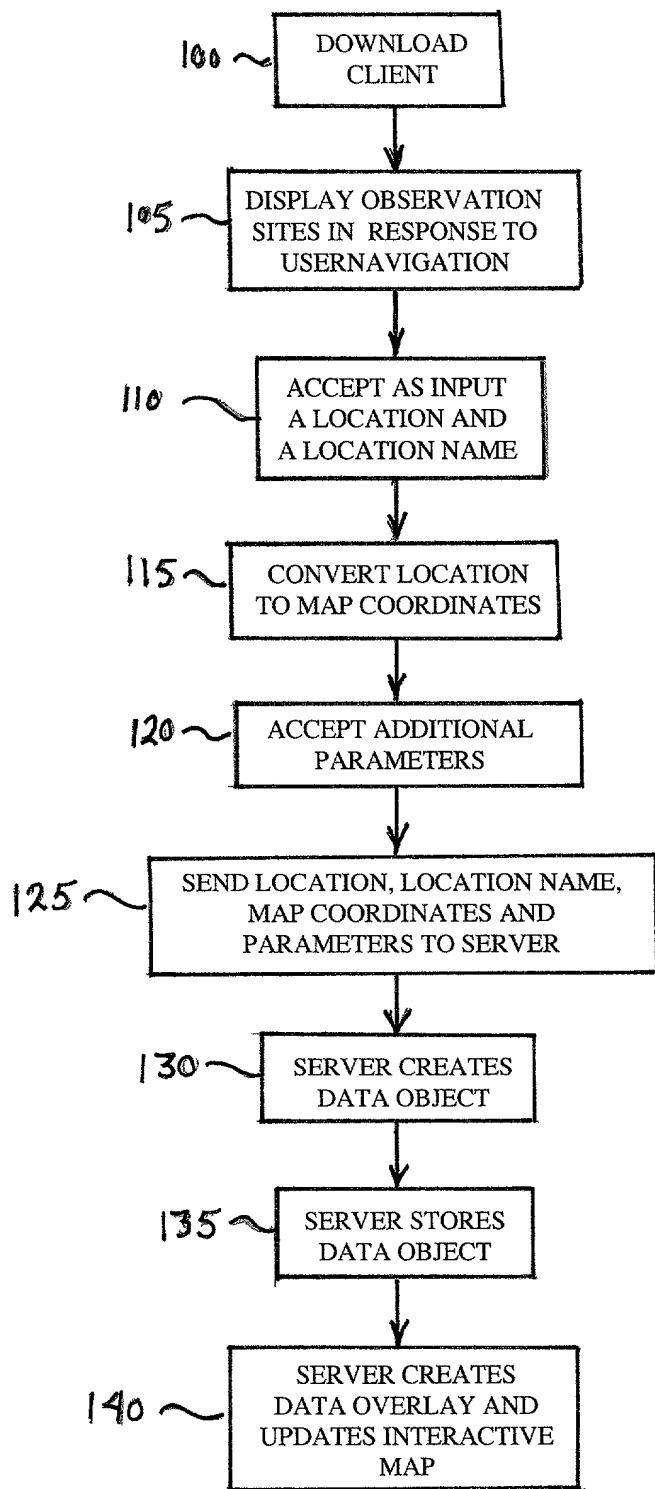


FIG. 2

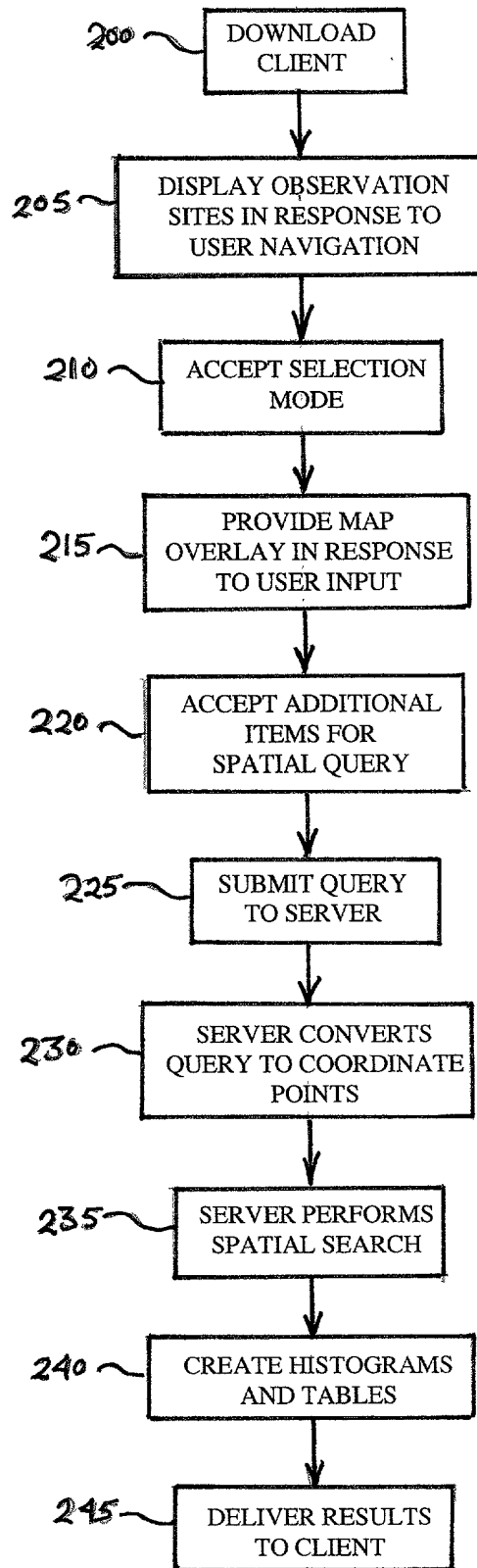


FIG. 3

350 ~	PROJ_ID
352 ~	OBS_DT
354 ~	SPECIES_CODE
356 ~	HOW_MANY
358 ~	VALID
360 ~	PROTOCOL_ID
362 ~	LOC_ID
364 ~	USER_ID
366 ~	DURATION_HRS
368 ~	COMMENTS
370 ~	CREATION_DT
372 ~	LAST_EDITED_DT
374 ~	REVIEWED

FIG. 5

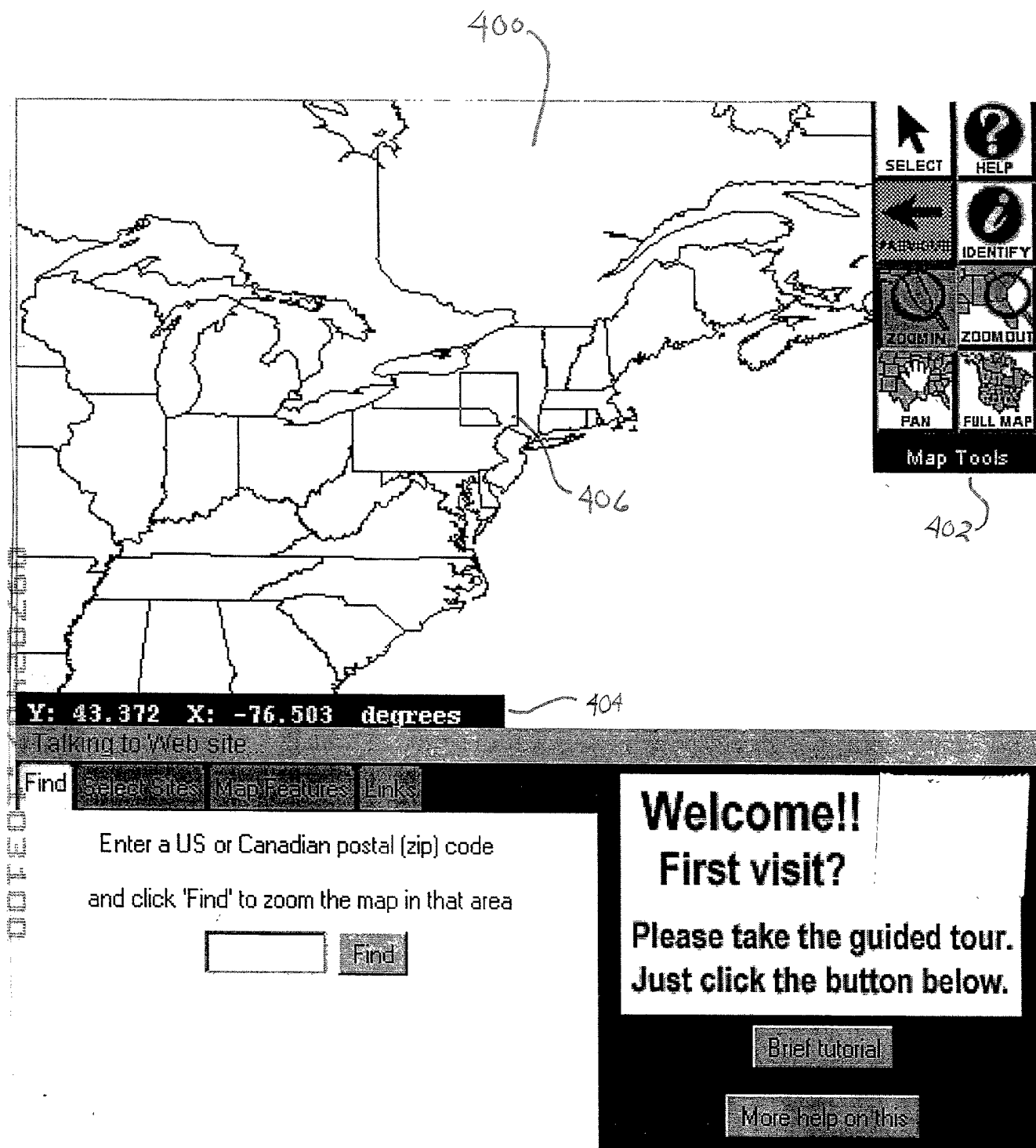


FIG. 6

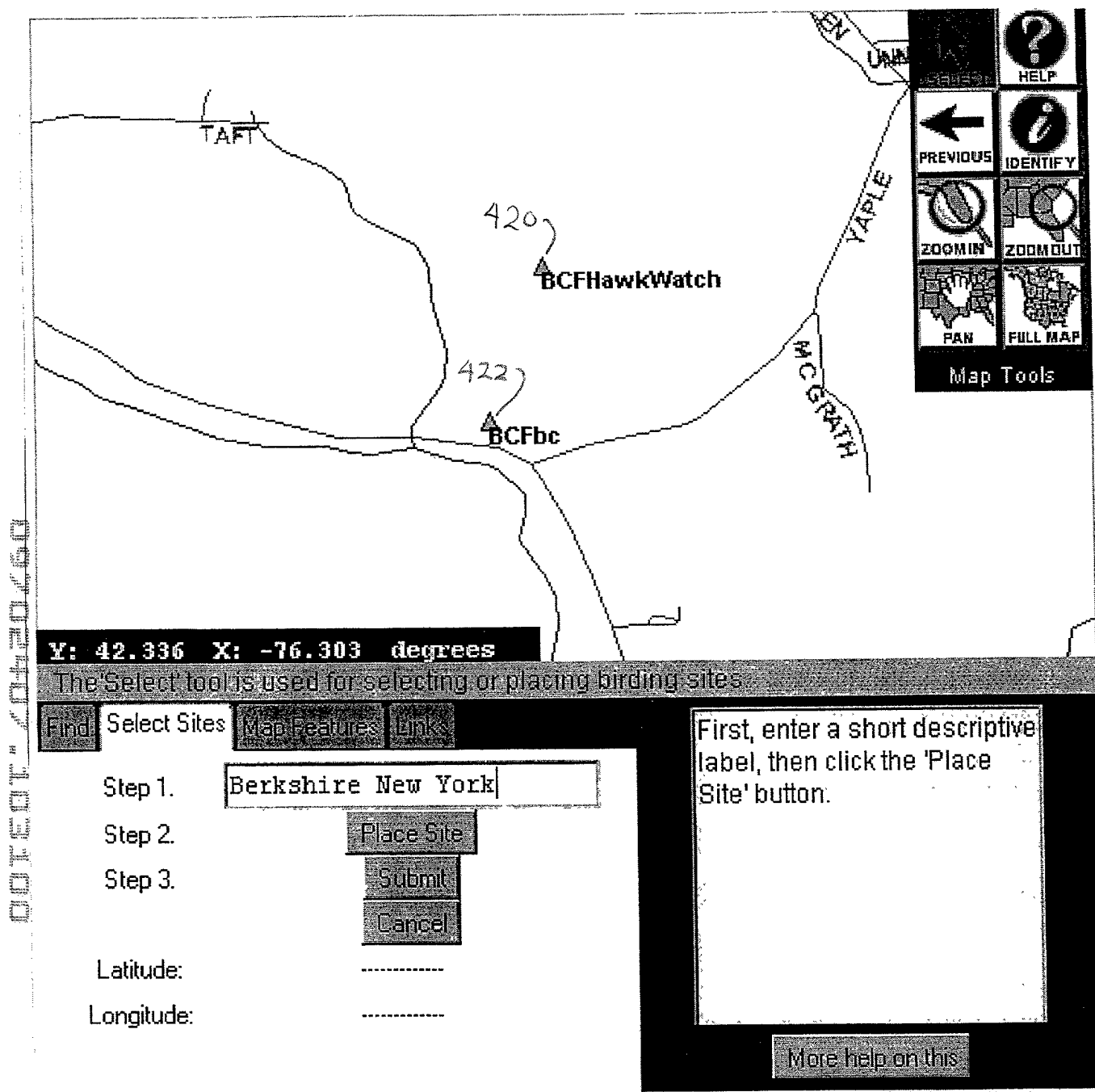


FIG. 7

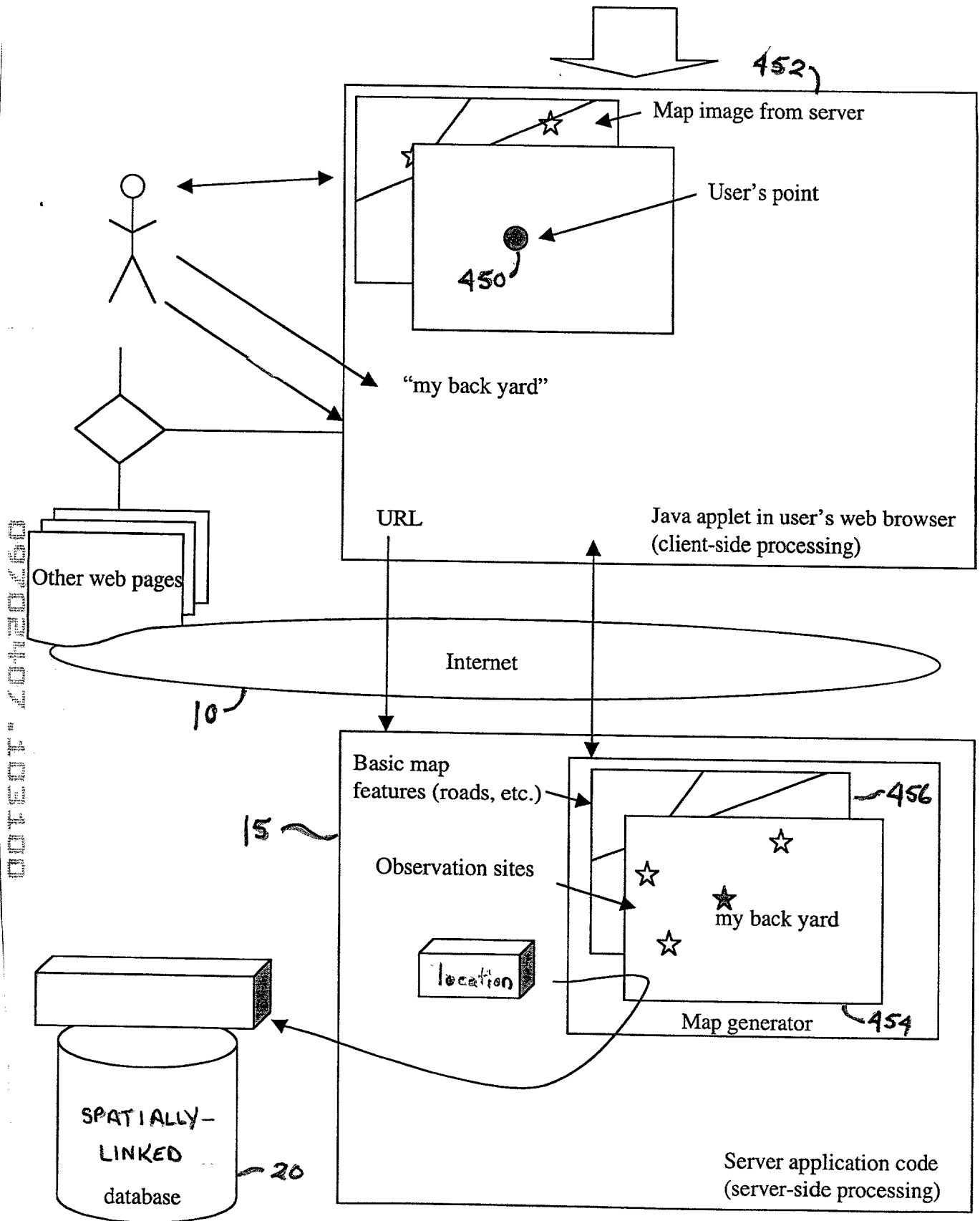


FIG. 8

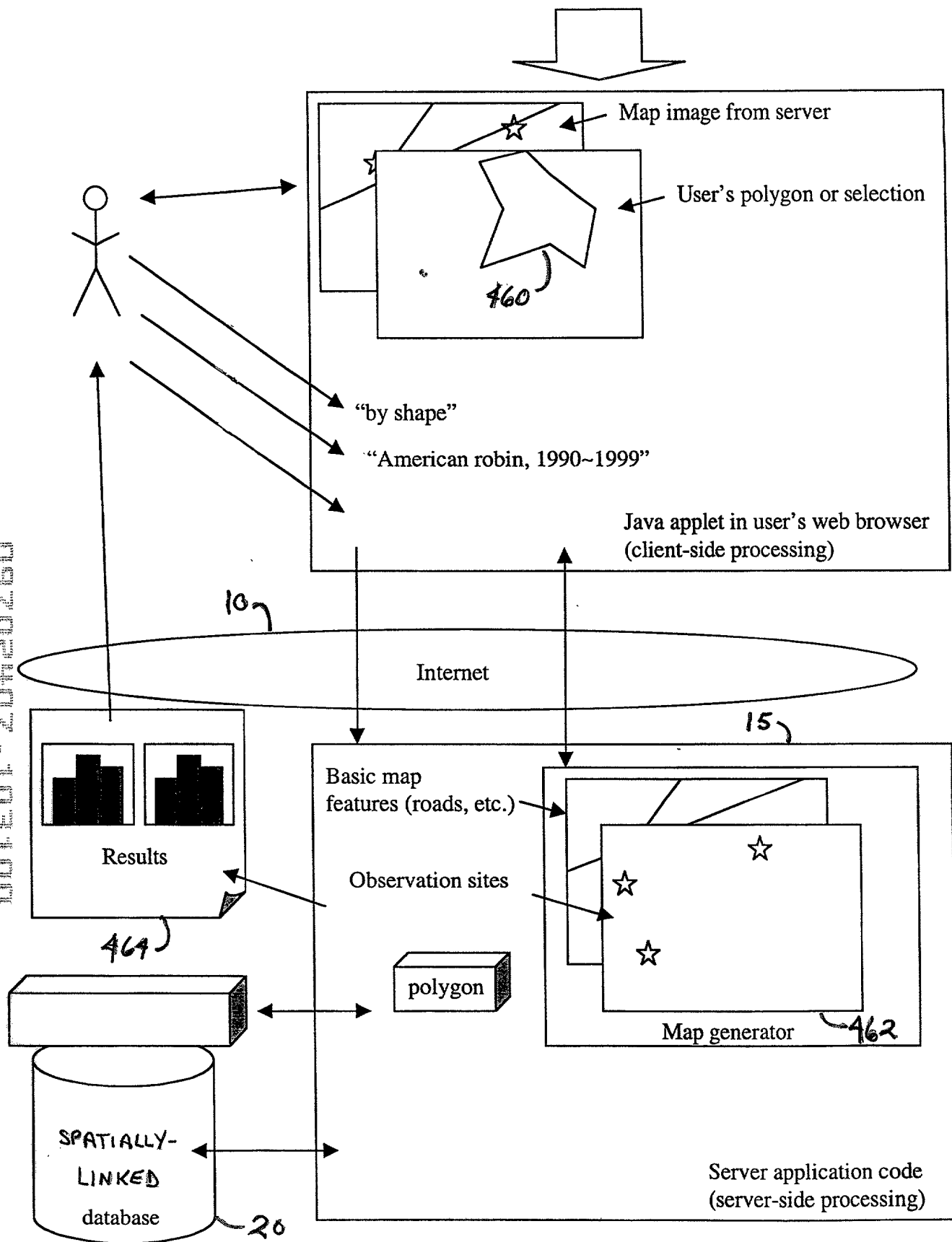


FIG. 9

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)	Attorney Docket Number	10845-131
	First Named Inventor	Steven T. Kelling
	COMPLETE IF KNOWN	
	Application Number	/
	Filing Date	Herewith
	Group Art Unit	
<input checked="" type="checkbox"/> Declaration Submitted with Initial Filing	OR	<input type="checkbox"/> Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)
Examiner Name		

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD AND APPARATUS FOR COLLECTING AND EXPRESSING
GEOGRAPHICALLY-REFERENCED DATA

the specification of which (Title of the Invention)

☒ is attached hereto
OR

☐ was filed on (MM/DD/YYYY) as United States Application Number or PCT International

Application Number and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent
Number

Parent Filing Date
(MM/DD/YYYY)

Parent Patent Number
(if applicable)

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As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

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or Bar Code Label

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor:

☐ A petition has been filed for this unsigned inventor

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☒ Additional inventors are being named on the 2 supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto

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ADDITIONAL INVENTOR(S)

Supplemental Sheet

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				ZIP		14850	
				Country		USA	
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Inventor's Signature				Date			
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				Country		USA	
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City		Rushland		State		PA	
				ZIP		18956	
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Page 2 of 2

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